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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 09/837,885      | 04/18/2001  | Jun Liu              | 1941-76             | 1062             |

7590

07/29/2004

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| EXAMINER |
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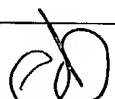
CHANG, VICTOR S

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| ART UNIT | PAPER NUMBER |
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1771

DATE MAILED: 07/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |                                      |                                   |   |
|------------------------------|--------------------------------------|-----------------------------------|---|
| <b>Office Action Summary</b> | <b>Application No.</b><br>09/837,885 | <b>Applicant(s)</b><br>LIU ET AL. |   |
|                              | <b>Examiner</b><br>Victor S Chang    | <b>Art Unit</b><br>1771           |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 08 June 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-4,53,55 and 75-91 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4,53,55 and 75-91 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Introduction*

1. Applicants' declaration, amendments and remarks filed on 6/8/2004 have carefully considered. Applicants' amendments to claims 1, 55, 75, 78-80 and 91, and cancellation of claims 67 and 92 have been entered. It is noted that claims 12-52, 57-65 and 71-74 are incorrectly listed as "non-elected claims". Since there has been no election requirement, and claims 12-52, 57-65 and 71-74 have previously been identified as duplicates of the pending claims (see Office action mailed 9/8/2003, section 1), please correct their status as being "(cancelled)" in the next communication.
2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
3. Rejections not maintained are withdrawn. In particular, it is noted that the preamble of independent claim 1 has been amended to recite "A dehydroxylated mesoporous silica film". Since the declaration by Suresh Baskaran is persuasive that dehydroxylation provides a thin film with a stable dielectric constant in ambient, humid conditions, the prior rejection over Brinker et al. (US 5858457) alone is withdrawn, because Brinker lacks a teaching of dehydroxylation of the silica film. However, Applicants' arguments are moot in view of the new grounds of rejection as follows.

### ***Claim Rejections - 35 USC § 103***

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4. Claims 1-4, 53, 55 and 75-91 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brinker et al. (US 5858457) in view of Cho et al. (US 5504042).

Brinker's invention is directed to a family of supported silica films with pore size in the approximate range 0.8-20 nm. Optically transparent, 100-500-nm (i.e., 0.1-0.5  $\mu\text{m}$ ) thick films exhibiting a unique range of microstructures and uni-modal pore sizes are formed. Applications of the film include low dielectric constant interlayers, etc. (Abstract). In Example 5, the film dielectric constant is determined to be 2.37 (column 9, line 29).

For claims 1 and 2, Brinker lacks a teaching that the silica film has been dehydroxylated to improve its relative and absolute stabilities. However, it is noted that Cho's invention is directed to an improved porous structure with improved dielectric properties by dehydroxylate the pore surfaces (Abstract). This surface modification typically replaces reactive surface groups such as hydroxyls and alkoxy groups with more stable surface groups such as methyl groups (column 4, lines 35-37). As such, in the absence of unexpected results, it would have been obvious to one of ordinary skill in the art to modify and dehydroxylate Brinker's dielectric silica film, as taught by Cho, motivated by the desire to obtain improved dielectric properties. As to the range of the relative stability and absolute stability of dielectric constant in a humid atmosphere, it is the Examiner's position that these properties are believed to be either anticipated by combined teaching of Brinker and Cho, or an obvious optimization to one skilled in the art of dielectric silica film, motivated by the desire to obtain suitable relative and absolute stabilities for applications.

For claim 3, Brinker is silent about the standard deviation of the film thickness. However, it is noted that Brinker teaches that spin-coating or other standard techniques may also be used (column 10, lines 19-21), which is the same coating method of the instant invention (specification, page 12, lines 9-18). As such, in the absence of unexpected results, a suitable standard deviation in film thickness is believed to be either anticipated by Brinker, or an obvious optimization to one skilled in the art, motivated by the desire to obtain a uniform dielectric film.

For claims 4 and 53, Brinker teaches in Example 8 the effect of substrate pre-conditioning at different relative humidity (RH). Brinker shows in Fig. 8 the XRD of the film samples before and after calcination at 400°C, and teaches that the film order as judged by the intensity and FWHM of the  $2\theta=2.4^\circ$  peak depends strongly on the pre-conditioning RH, with the greatest order achieved at 60% RH (column 10, lines 26-29). As such, it is the Examiner's position that it is known art that the order of the porosity can be modified over a wide range by modifying the RH during calcinations, as taught by Brinker, including the range of the disordered porosity of the instant claimed invention.

For claim 55, the preamble has been amended to recite "A surfactant-templated mesoporous dielectric film on a substrate prepared by evaporation from silica precursors having greater than eight carbon atoms for every one silica atom". The Examiner notes that the use of silica precursors having greater than eight carbon atoms for every one silica atom clearly fails to exclude the applied art from the scope thereof, particularly in view of the fact that the instantly claimed invention as being stable both

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relatively and absolutely, which appears to be anticipated by a dehydroxylated silica film, as set forth above, and it should be noted that the hydroxyl and alkoxyl groups are removed during dehydroxylation, i.e., the carbon number of alkoxy group of the intermediary precursors is absent from the invention as claimed.

For claims 75-90, the Examiner notes that the recited method limitations have not been shown on the record to produce a patentably distinct article, as such the formed articles are rendered *prima facie* obvious. In particular, the Examiner repeats that, in the absence of new and/or unexpected results, the compositions of the silica precursors fail to exclude the applied art from the scope thereof, as set forth above. It should be pointed out that product-by-process claims are product claims and that to be limiting in a product claim, a process limitation must be evidenced as effecting the structure or chemistry of the resultant product over the prior art. Further, the burden of proof for this showing is on Applicant after the Examiner presents an otherwise *prima facie* rejection. Note MPEP 2113 for a more detailed description.

### ***Response to Amendment***

5. Applicants' argument "the Figure 8 of the Brinker reference is difficult to read, but does not appear to show a disordered porosity as defined by a peak between about 0.75 and 2 degrees 2-theta, or the absence of a peak in the range of 2-6 degrees 2-theta ... As can be seen in this figure, the peaks for the heated wafer ... all have a peak between 0 and 0.5 degrees 2-theta. Therefore, Brinker's teachings do not include "the range of the disordered porosity of the instant claimed invention." (Remarks, page 8,

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first full paragraph) has been carefully considered, but is not persuasive. The Examiner notes that the in Figure 8, clearly the horizontal axis (x-axis) ranges from 1 to 10 (proportionally, the starting point is 1, not 0). As such, the peaks shown are between 1 to 2, which read on the invention as claimed, Applicants' argument to the contrary notwithstanding.

### ***Conclusion***

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Victor S Chang whose telephone number is 571-272-1474. The examiner can normally be reached on 8:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Terrel H Morris can be reached on 571-272-1478. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.


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For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

*VSC*

Victor S Chang  
Examiner  
Art Unit 1771

7/21/2004



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SUPERVISORY PATENT EXAMINER  
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